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NON-LINEAR DISTRIBUTION OF VOLTAGE STEPS IN FLASH-TYPE A/D CONVERTERS

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The present invention relates to a method, apparatus, and system for converting an input voltage to a digital output.

Current flash-type analog-to-digital (A/D) converters are characterized by high relative error at low input voltage. Accordingly, there is a need for a method, apparatus, and system that efficiently reduces the relative error in the digital output of a flash-type A/D converter at low input voltage.

In first embodiments, the present invention provides a flash-type analog-to-digital (A/D) converter, said A/D converter adapted to convert an input voltage VIN to a digital output, wherein VIN is within a working voltage range of the A/D converter, said working voltage range defined by a lowest voltage VREF- and a highest voltage VREF+, said A/D converter comprising:

N reference voltages V1, V2, ..., VN non-linearly distributed between VREF- and VREF+ and ordered according to VREF- < V1 < V2 < ...< VN < VREF+, wherein N is at least 3;

N comparators associated with said N reference voltages on a one-to-one basis, each comparator adapted to make a comparison between VIN and the reference voltage that is associated with said comparator, each comparator adapted to generate a binary bit that reflects a binary result of said comparison; and

encoder means for generating the digital output from an analysis of the binary bits generated by said comparators.

In second embodiments, the present invention provides a method for converting an input voltage VIN to a digital output such that VIN falls between a lowest voltage VREF- to a maximum voltage VREF+, said method comprising:

providing N reference voltages V1, V2, ..., VN non-linearly distributed between VREF- and VREF+ and ordered according to VREF- < V1 < V2 < ...< VN < VREF+, wherein N is at least 3;;

comparing VIN with each of the N reference voltages;

generating a binary bit for each said comparisons, said binary bit reflecting a binary result of said comparison; and

generating the digital output from an analysis of the generated binary bits.